



**U.S. Army
Environmental
Center**

FINAL

**No Further Action Decision Under CERCLA
Study Area 10: Construction Debris Area**

**Fort Devens Main Post Site Investigation
Fort Devens, Massachusetts**

Prepared for:

**U.S. ARMY ENVIRONMENTAL CENTER
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List of Acronyms and Abbreviations

ABB	ABB Environmental Services, Inc.
AWQC	Ambient Water Quality Criteria
BAF	Bioaccumulation Factor
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CMR	Code of Massachusetts Regulations
DDD	1,1-dichloro-2, 2-bis(p-chlorophenyl) ethane
DDE	Dichlorophenyl-dichloro-ethylene
DDT	Dichlorodiphenyl trichloroethene
DOD	Department of Defense
EPA	United States Environmental Protection Agency
ER-L	Effects Range-Low
ER-M	Effects Range-Medium
IRP	Installation Restoration Program
kg	Kilograms
MADEP	Massachusetts Department of Environmental Protection
MCP	Massachusetts Contingency Plan
MEP	Master Environmental Plan
mg	Milligrams
mg/kg	Milligrams Per Kilogram (parts per million)
MSL	Mean Sea Level
NFA	No Further Action
NOAA	National Oceanic and Atmospheric Administration
NPL	National Priorities List
NYSDEC	New York State Department of Environmental Conservation
PA	Preliminary Assessment
PAH	Polynuclear Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PCL	Protective Contaminant Level
PRE	Preliminary Risk Evaluation
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
SA	Study Area
SARA	Superfund Amendments and Reauthorization Act
SI	Site Investigation
SVOC	Semivolatile Organic Compound
TCLP	Toxicity Characteristic Leaching Procedure
TPHC	Total Petroleum Hydrocarbons
TRC	Technical Review Committee
µg/g	Micrograms Per Gram (parts per million)
µg/L	Micrograms Per Liter (parts per billion)
USACE	United States Army Corps of Engineers
USAEC	United States Army Environmental Center
VOC	Volatile Organic Compound

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Executive Summary

Investigations of Study Area 10 (Construction Debris Area) at Fort Devens, Massachusetts, have resulted in the decision that no further studies or remediation are required at this site. Study Area 10 was identified in the Federal Facilities Agreement between the U. S. Environmental Protection Agency and the U.S. Department of Defense as a potential site of contamination.

Fort Devens was placed on the National Priorities List under the Comprehensive Environmental Response, Compensation and Liability Act as amended by the Superfund Amendments and Reauthorization Act on December, 21, 1989. In addition, under Public Law 101-510, the Defense Base Realignment and Closure Act of 1990, Fort Devens was selected for cessation of operations and closure. In accordance with these acts and to support the overall mission of environmental restoration and base closure, numerous studies have been conducted that address Study Areas at Fort Devens, including a Master Environmental Plan, an Enhanced Preliminary Assessment, and Site Investigation Reports.

The Site Investigation of Study Area 10 was completed in 1993 in conjunction with 12 other study areas as part of the Main Post Site Investigation.

SA-10 is an approximately 80-acre parcel located adjacent to the Shirley Gate at the northwest corner of the Main Post. The site is bordered by West Main Street to the north-northwest, Trout Brook to the north, Perimeter Road to the south-southeast, and the Nashua River to the east. The former Hospital-North was previously located in the area surrounded by Perimeter Road at SA-10.

The site is now used for residential housing and recreational fields and gardens. The SA-10 parcel has been designated for future use as retail/local government, residential, and open space, according to the *Devens Reuse Plan* (Massachusetts Land Bank, 1993).

SA-10 is identified as Landfill No. 6 in *The Master Environmental Plan for Fort Devens, MA* (MEP) (Argonne National Laboratory, 1992). According to the MEP, debris from the demolition of six warehouses associated with the former hospital was reportedly disposed of in a trench on the site. However, the MEP notes that no evidence of the disposal area was found. The 1992 *Enhanced Preliminary Assessment* (Enhanced PA) (Weston, 1992) indicates that building debris from the old hospital was buried near the existing Shirley Housing area, but the exact location was never identified. The Enhanced PA also notes that no evidence of the disposal area was found at the SA-10 location.

Results of this site investigation did not indicate that disposal of waste or debris took place at SA-10, with the exception of concrete slabs observed at the surface along the easternmost perimeter of the study area. Subsurface solid waste was not encountered during test pit excavation and the geophysical survey results showed no indication of significant subsurface debris.

Executive Summary

1 The detection of low concentrations of metals and trace concentrations of pesticides
2 in soils of SA-10 do not appear to indicate a source of contamination. Based on the
3 results of the preliminary risk evaluation, the detected concentrations of these soil
4 analytes are not likely to pose an unacceptable risk to human health or the
5 environment. Although several metals, pesticides, and PAHs in surface water and
6 sediments of the Nashua River may pose an ecological risk, these river sediment
7 contaminants do not appear to be attributable to SA-10.

8
9 On the basis of findings at SA-10, there is no evidence or reason to conclude that
10 construction debris was ever landfilled at this site or that there is significant
11 contamination which would pose a threat to human health and the environment. The
12 decision has been made to remove SA-10 from further consideration in the
13 Installation Restoration Program (IRP) process.
14
15
16

1.0 Introduction

This decision document has been prepared to support a No Further Action decision at Study Area (SA) 10 - Construction Debris Area, at Fort Devens, Massachusetts. The report was prepared as part of the U.S. Department of Defense (DOD) Base Realignment and Closure (BRAC) program to assess the nature and extent of contamination associated with site operations at Fort Devens. Under Public Law 101-510, the Defense Base Realignment and Closure Act of 1990, Fort Devens has been selected for cessation of operations and closure. An important aspect of BRAC actions is to determine environmental restoration requirements before property transfer can be considered. Studies at SA-10 were conducted to support this overall mission.

In conjunction with the Army's Installation Restoration Program (IRP), Fort Devens and the U.S. Army Environmental Center (USAEC; formerly the U.S. Army Toxic and Hazardous Materials Agency) initiated a Master Environmental Plan (MEP) in 1988. The MEP consists of assessments of the environmental status of SAs, specifies necessary investigations, and provides recommendations for response actions with the objective of identifying priorities for environmental restoration at Fort Devens. SA-10 was identified as a potential source of contamination in the MEP (Argonne National Laboratory, 1992). On December 21, 1989, Fort Devens was placed on the National Priorities List (NPL) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA).

An Enhanced Preliminary Assessment (PA) (Weston, 1992a) was also performed at Fort Devens to address areas not normally included in the CERCLA process, but requiring review prior to closure. A final version of the PA report (Weston, 1992b) was completed in April 1992. In 1992, DOD, through USAEC, also initiated a Site Investigation (SI) of SA-10 along with twelve other SAs as part of the Main Post Site Investigation at Fort Devens. The SI Report (Arthur D. Little, Inc., 1993a), recommended No Further Action at SA-10.

2.0 Background and Physical Setting

2.1 Fort Devens Description and Land Use

Fort Devens is located in Middlesex and Worcester Counties, Massachusetts, approximately 35 miles west of Boston, Massachusetts. Fort Devens is located in portions of four towns - Ayer, Harvard, Lancaster, and Shirley. Fort Devens currently covers approximately 9,280 acres, consisting of the Main Post, North Post, and South Post areas. Massachusetts Highway Route 2 crosses Fort Devens and separates the Main Post from the South Post (Figure 2-1).

The majority of the facilities at Fort Devens lie within the Main Post, located north of Massachusetts Highway Route 2. The Main Post provides all of the on-post housing, including over 1,700 family units and 9,800 bachelor units (barracks and unaccompanied officers' quarters). Other facilities on the Main Post include community services (e.g., the shoppette, cafeteria, post exchange, bowling alley, golf course, and hospital), administrative buildings, classroom and training facilities, maintenance facilities, and ammunition storage.

The South Post is located south of Route 2 and contains training areas, ranges, and a drop zone. The North Post abuts the Main Post to the north of West Main Street in Ayer. The principal activities on the North Post are the Waste Water Treatment Plant and the Moore Army Airfield.

The terrain surrounding Fort Devens includes rolling areas and wooded hills. Fort Devens is located in the Nashua River Basin, and approximately 8 miles of the river, running from south to north, lie within the reservation boundaries (Figure 2-1). Several lakes and ponds are located within Fort Devens. Land surface elevations within Fort Devens range from about 200 feet above mean sea level (MSL) along the Nashua River on the northern boundary to 450 feet above MSL in the southern portion of the installation.

The surrounding towns (Ayer, Harvard, Shirley, and Lancaster) are zoned for residential, commercial, and limited industrial development. All have fewer than 10,000 residents, except Harvard, which has an estimated 13,000.

2.2 Regional Geology

The surficial geology throughout most of Fort Devens is characterized by glacially derived unconsolidated sediments. A mantle of Pleistocene-age glacial till, outwash, and lacustrine (lake) deposits, ranging in thickness from a few inches to approximately 100 feet, blanket the irregular bedrock surface underlying Fort Devens. The glacial lake deposits consist chiefly of sand and gravelly sand. Post-glacial deposits consist mostly of river-terrace sands and gravels; fine alluvial sands and silts beneath modern floodplains; and muck, peat, silt, and sand in swampy areas.

2.0 Background and Physical Setting

1 The surficial deposits are underlain by a complex assemblage of intensely folded and
2 faulted metasedimentary rocks with occasional igneous intrusions. Bedrock occurs at
3 depths of approximately 100 feet to ground surface where it outcrops at Shepley's
4 Hill. Bedrock is typically unweathered to only slightly weathered at Fort Devens, as
5 is typical in glacial terrain.

2.3 Regional Hydrogeology

10 Fort Devens lies within the Nashua River drainage basin. The Nashua River flows
11 south to north through the installation, and is the eventual discharge locus for all
12 surface water and ground water flow at the installation. The water of the Nashua
13 River has been assigned to Class B under Commonwealth of Massachusetts
14 regulations. Class B surface water is "designated for the uses of protection and
15 propagation of fish, other aquatic life and wildlife, and for primary and secondary
16 contact recreation" (314 CMR 4.03). The Nashua River and its major tributaries are
17 shown on Figure 2-1.

18
19 Glacial outwash deposits constitute the primary aquifer at Fort Devens. Ground water
20 also occurs in the underlying bedrock; however, flow is limited because the rocks
21 have no primary porosity and water moves only in fractures and dissolution voids.
22 Ground water in the surficial aquifer at Fort Devens has been assigned to Class I
23 under Commonwealth of Massachusetts regulations. Class I consists of ground waters
24 that are "found in the saturated zone of unconsolidated deposits or consolidated rock
25 and bedrock and are designated as a source of potable water supply"
26 (314 CMR 6.03). Ground water provides the main source of potable water for Fort
27 Devens. Ground water is pumped from three large-diameter and 74 small-diameter
28 production wells.

2.4 Study Area Description and History

2.4.1 Study Area Description and Land Use

34 SA-10 is an approximately 80-acre parcel located adjacent to the Shirley Gate at the
35 northwest corner of the Main Post. The site is bordered by West Main Street to the
36 north-northwest, Trout Brook to the north, Perimeter Road to the south-southeast, and
37 the Nashua River to the east (Figure 2-2). The former Hospital-North was previously
38 located in the area surrounded by Perimeter Road at SA-10.

39
40 The site is now used for residential housing and recreational fields and gardens. The
41 SA-10 parcel has been designated for future use as retail/local government,
42 residential, and open space, according to the *Devens Reuse Plan* (Massachusetts Land
43 Bank, 1993).

2.0 Background and Physical Setting

Results of this site investigation did not indicate that disposal of waste or debris took place at SA-10, with the exception of concrete slabs observed at the surface along the easternmost perimeter of the study area. Subsurface solid waste was not encountered during test pit excavation and the geophysical survey results showed no indication of significant subsurface debris.

2.4.2 Related Investigations and Site History

SA-10 is identified as Landfill No. 6 in *The Master Environmental Plan for Fort Devens, MA* (MEP) (Argonne National Laboratory, 1992). According to the MEP, debris from the demolition of six warehouses associated with the former hospital was reportedly disposed of in a trench on the site. However, the MEP notes that no evidence of the disposal area was found. The *Enhanced Preliminary Assessment* (Enhanced PA) (Weston, 1992a, 1992b) indicates that building debris from the old hospital was buried near the existing Shirley Housing area, but the exact location was never identified. The Enhanced PA also notes that no evidence of the disposal area was found at the SA-10 location.

In addition, the Enhanced PA states that although the site was reportedly active from 1975 to 1980, the EPIC (1991) evaluation of photographs from 1943 to 1991 indicated no photographic evidence of the site.

Reviews of records and interviews with Fort Devens personnel during the Main Post SI indicate that the former Hospital-North was built on the site between 1941 and 1942, and was operated during World War II. The hospital was constructed of wood with concrete foundations. A coal fired boiler house located on the northwest side of Perimeter Road provided heat for the hospital. Coal for the boiler was delivered via a rail spur that crossed West Main Street from the existing Boston and Main Railroad track. Steam pipes ran through cement culverts from the boiler house to the hospital. Piping and foundations were the only materials located underground. Coal ash from the boiler was reportedly disposed of in the Shepley's Hill Landfill, or taken off site.

After World War II, the hospital was converted into GI housing units, and subsequently was used for family housing in the 1950s. A small residential trailer park existed northeast of Perimeter Road and contained 15 to 20 families. Each trailer had a 275-gallon above ground oil storage tank and was connected to the Army municipal sewer system. Army personnel were unsure when the trailer park was removed from the area.

The original hospital/housing structure and boiler house, with the exception of six units, were demolished by the Army during the early to mid-1960s. Foundations and underground piping were reportedly left in place at the site. The demolition debris consists of wood, concrete and piping. It is unknown whether asbestos was present in the buildings prior to demolition. Information received during interviews indicate that the majority of the demolished material was disposed of along a utility right-of-way along the eastern side of the Nashua River between Hospital Road and Grant Road.

2.0 Background and Physical Setting

1 However, there was also some suggestion during the interviews that debris disposal
2 may have occurred along the northeastern boundary of the study area.

3
4 The existing residential housing complex, referred to as Capehart housing, was
5 constructed on the site in 1965. The remaining six hospital/housing units were
6 converted into warehouses, and were subsequently demolished in 1972 to 1973.
7 Debris from the demolition of the six warehouses was placed in the North Post
8 Landfill, located near Walker Road. The North Post Landfill is currently being
9 investigated as SA-9 in Group 5. The remaining area around the housing is currently
10 used as baseball and soccer fields.

11
12 Historical aerial photographs of Fort Devens were examined to document land uses
13 and conditions. The photographs confirmed the presence of the Hospital-North at
14 SA-10 for the years 1943, 1952, and 1959. Also noted in these photos were a railroad
15 spur, coal storage shed, and boiler house along the western boundary of the study
16 area. While the hospital was no longer present in the 1965 and 1972 photos,
17 foundations of former buildings were observed, suggesting the buildings were leveled
18 to the ground surface and removed, leaving only the foundations in place. Since
19 1972, ballfields have been constructed over the former location of the hospital.

20
21 Two elongated features were identified on the 1980 aerial photo that correspond to
22 the mapped location of SA-10 in the MEP. However, these features appear to be flat
23 areas, approximately 380 by 130 feet each, cleared of grass and vegetation. The
24 features appear similar in appearance to a longer feature, approximately 1,800 feet in
25 length and 130 feet wide, along the southeast side of Lowell Road. These features
26 were not present in the previous 1972 photograph. Due to the presence of hospital
27 foundations in these areas it is likely that these features represent shallow surficial
28 features. Additionally, due to the presence of foundations and underground piping in
29 this area, geophysical surveys would not likely be able to provide information on
30 these features or to distinguish disturbed subsurface soils. Possible explanations for
31 these features include tilled areas associated with gardens or reseeded. There is no
32 evidence that these features represent trenches or debris disposal areas and
33 information obtained during the SI indicates that debris from demolition of the six
34 warehouses was disposed in the North Post Landfill. The area of these features is
35 currently used as playing fields.

2.4.3 Geology of Study Area SA-10

36
37 Study Area SA-10 is at an elevation of approximately 275 feet above MSL. The
38 study area is located on a generally flat terrace that slopes steeply toward the Nashua
39 River to the east and Trout Brook to the north. Bedrock was mapped at an elevation
40 of 150 feet above MSL in the *Ground Water Flow Model at Fort Devens,*
41 *Massachusetts* (Engineering Technology Associates, 1992). Subsurface soils
42 encountered in test pits consisted of 1 to 2 feet of topsoil underlain by silty fine sand
43 to a depth of 4 feet, in turn underlain by fine to medium gravelly sand. No debris
44 was identified in the subsurface excavations.
45
46

2.0 Background and Physical Setting

2.4.4 Hydrogeology of Study Area SA-10

Study Area SA-10 is adjacent to the Nashua River, and ground water flows toward the river to the northeast. SA-10 is also bordered by Trout Brook, which flows in an easterly direction into the Nashua River. The ground water model report (Engineering Technologies Associates, 1992) indicates that ground water in both the glacial outwash aquifer and the bedrock aquifer in this area flows north to northeast toward the river. According to the report, the ground water elevation for the glacial outwash aquifer in the area of SA-10 is at approximately 53 feet below grade. Ground water was not encountered in any of the test pits completed during the Main Post SI, which were excavated to depths of 14 to 16 feet.

3.0 Site Investigation

3.1 Site Investigation Report

The investigation of SA-10 was done in conformance with the *Final Supplemental Work Plan -Main Post Site Investigation (SI) - Fort Devens, MA* (Revision 1) (Arthur D. Little, 1993b).

The scope of work for SA-10 included:

- Records review, interviews, and review of historical aerial photographs
- Visual reconnaissance
- Geophysical survey (magnetic and electromagnetic terrain conductivity surveys) at 10-foot intervals (for the magnetic survey) along lines spaced 25 feet apart over approximately 10 acres of the site to identify and define the limits of potential debris disposal areas identified during the site walk-over
- Three test pits with one soil sample per pit to visually and chemically confirm the presence or absence of buried waste
- Collection and analysis of one composite sample from the three test pits for RCRA hazardous waste characterization
- Surface water and bottom sediment sampling of the Nashua River and Trout Brook at locations upstream and downstream of SA-10

The Final SI report (Arthur D. Little, 1993a) presents documentation of methods and activities performed during the Main Post SI and discusses the results of the SI, including conclusions and recommendations for each study area. The SI Report recommends No Further Action for SA-10.

3.2 Preliminary Risk Evaluation

The criteria and guidelines used for screening risks in the PRE are described below. A complete summary of criteria and guideline values used in the Main Post SI PREs is presented in the Final SI Report (Arthur D. Little, 1993a). Uncertainties and assumptions associated with the risk evaluation methodologies are also discussed in the Final SI report.

3.2.1 Human Health Risk Evaluation Methodology

3.2.1.1 Soil Risk Evaluation Methodology

EPA Region III Risk-Based Concentration Table (EPA, 1993). EPA Region III has developed risk-based soil concentrations based on published reference doses and cancer potency slopes and "standard" exposure scenarios. The concentrations reported

3.0 Site Investigation

correspond to a hazard quotient of 1, indicating no risk of noncarcinogenic effects, or a lifetime cancer risk of one in 1 million, whichever is lower. Both residential and commercial/industrial health-protective soil guidelines are published by EPA Region III.

Massachusetts Contingency Plan (MCP), July 1, 1993. Categories of health-protective soil guidelines were established by the Massachusetts Department of Environmental Protection (MADEP, 1993) for use in the characterization of risk posed by disposal sites. For assumed future residential use, study area concentrations are compared to the Method 1 GW-1/S-1 category. The S-1 category indicates that the soil is accessible and that both child and adult frequency or intensity of use may be high. The GW-1 category additionally assumes the potential use of the ground water as a drinking water source. For assumed future commercial/industrial use, study area soil concentrations are compared to the GW-1/S-2 category. The S-2 category indicates high adult use of the area, and minimal use of the area by children. For chemicals with no soil guidelines, we have used reportable concentrations published in the MCP guidelines. It should be noted that although Method 1 standards are used for screening purposes in the PRE, Method 1 is strictly applicable to a disposal site if there is a standard for each oil and hazardous material of concern, and if the oil or hazardous material is present in and will foreseeably migrate only within ground water and soil.

3.2.2 Ecological Risk Evaluation Methodology

3.2.2.1 Soil Risk Evaluation Methodology

Surface Soil Ecological Protective Contaminant Levels. The ecological criteria (protective contaminant levels, PCLs) used for comparison to detected concentrations in soils were derived from the ABB chronic exposure food web model documented in the SI Report for Groups 2 and 7 (ABB, 1992). No state or federal standards or guidelines exist to evaluate potential effects due to the ingestion of food and surface soil by terrestrial organisms. The PCLs estimate the potential dietary exposure for several potential receptor species at Fort Devens, using published bioaccumulation factors (BAFs), dietary profiles, and ingestion rates for the indicator species. These PCLs are assumed to protect the most sensitive of the modeled indicator species (i.e., short-tailed shrew) from direct toxic effects and/or bioaccumulation-mediated toxic effects.

3.2.2.2 Surface Water Risk Evaluation Methodology

EPA Ambient Water Quality Criteria (AWQC), (EPA, 1992). AWQC are developed by the EPA for the protection of aquatic life. The chronic aquatic AWQC are more applicable to the conditions found at Fort Devens, and thus are used in this PRE. AWQC are designed to be protective of most aquatic species in all life stages, and are based on chronic toxicological data for animals and plants, and on residue levels in aquatic organisms. If these criteria are not exceeded, most species of aquatic life would be protected. The chronic AWQC is the contaminant concentration that should

3.0 Site Investigation

not be exceeded by the four-day average chemical concentration more than once every three years. When hardness data are available from the study area, hardness-dependent chronic AWQC (for selected inorganics) are adjusted using an average hardness for the study area.

3.2.2.3 Sediment Risk Evaluation Methodology

Detected concentrations of contaminants in sediments are compared to the following two guidelines: the National Oceanographic and Atmospheric Administration Effects Range - Low (NOAA, 1990), and the New York State Department of Environmental Conservation Sediment Quality Criteria (NYSDEC, 1989). In addition, sediment concentrations are compared to ecological soil protective contaminated levels (PCLs) calculated to be protective of terrestrial species. The rationale for including surface soil guidelines in these comparisons is that during summer, the sediments in wetlands and along the Nashua River banks may dry out and become exposed. During these dry periods, terrestrial species may be exposed to contaminants in surface soils via the ingestion of earthworms or other invertebrates.

National Oceanographic and Atmospheric Administration Effects Range - Low, March 1990. The National Oceanographic and Atmospheric Administration (NOAA) collected data on sediment toxic effects levels for various biota from sites throughout the U.S. (NOAA, 1990). These data were compiled in order of concentration associated with biological effects, and the lower 10th percentile and median concentrations of the data were identified. The lower 10 percentile of the data is identified as an Effects Range-Low (ER-L), while the median value is termed an Effects Range-Median (ER-M). study area sediment data are compared to ER-L sediment toxicity values; this is a conservative approach, which is appropriate for this screening level risk assessment.

New York State Department of Environmental Conservation (NYSDEC) Sediment Quality Criteria, December, 1989. For organic compounds, the NYSDEC Sediment Quality Criteria (NYSDEC, 1989) have been calculated using the equilibrium partitioning approach, and use the ambient water quality standard or guidance value for each chemical. This approach is based on the theory that toxics in sediments will exert their effect to the extent that the chemical becomes freely bioavailable in the sediment interstitial water. The bioavailability of non-polar organics in sediments is based on the fraction of organic carbon in the sediment (the sediment/organic carbon partition coefficients, or K_{oc}). Since the octanol/water partition coefficient (K_{ow}) is nearly equal to the sediment/organic carbon partition coefficient, the K_{ow} was used by NYSDEC in the calculation. To derive a sediment criterion for a specific sediment, the NYSDEC Sediment Quality Criterion is multiplied by the average of the organic carbon content values in sediments for each study area. For inorganics, the NYSDEC criteria are based on a geometric mean of a no-effect and lowest effect level for benthic organisms to derive sediment criteria.

4.0 Contamination Assessment

4.1 Geophysical Survey

The results of the terrain conductivity and magnetic geophysical surveys did not indicate that buried refuse exists in this area. Several anomalies were identified by the survey; however, these anomalies were ground checked and were correlated with surficial features. The anomalies indicated by the geophysical data and the results of the ground check are presented in the Main Post SI Report. In most cases, the anomalies were correlated with utilities or surface metal (e.g., fence posts).

4.2 Test Pit Soil Sampling Evaluation

Three test pits were located along the eastern edge of the geophysical survey area along the area where surficial construction debris consisting of concrete slabs was observed (Figures 2-2 and 2-3). One soil sample was collected from each of the three test pits for analysis. The results of soil analyses for test pit soil samples are summarized in Table 4-1 and on Figure 4-1.

No VOCs or SVOCs were detected in the soil samples. Trace concentrations of three pesticides (DDD, DDE, and DDT) were detected in one of the three excavations, 10E-93-03X. The concentrations of these pesticides are at the low end of the Fort Devens Pesticide Background Range (Arthur D. Little, 1993a). Metals detected at concentrations above background included copper, iron, manganese, and nickel.

The results of the TCLP and waste characterization analyses indicate no exceedence of the regulatory levels under 40 CFR 261.30 Subpart C. The results of the TCLP analyses are summarized in the Main Post SI Report (Arthur D. Little, 1993a).

4.3 Surface Water and Sediment Sampling Evaluation

To evaluate the potential impact of SA-10 on surface water and bottom sediments, samples were collected from the Nashua River and Trout Brook at locations upstream and downstream of the site (Figure 4-2). The results of the analysis of surface water and sediment samples are summarized in Tables 4-2 and 4-3.

Although a slight increase in the number and concentrations of detected compounds in sediments was noted between the upstream and downstream locations in Trout Brook and some metals were detected at slightly higher concentrations in the downstream location, a comparison of these compounds and concentrations with those identified both upstream and downstream of SA-10 in the Nashua River indicates that all detected contaminants are present at comparable or greater concentrations at upstream locations along the river. It is likely that higher concentrations of some analytes in the downstream Trout Brook location are derived from the Nashua River, since this location lies within the river's floodplain.

4.0 Contamination Assessment

1 Furthermore, there were no significant contaminants detected at SA-10 that would be
2 expected to impact adjacent surface water and sediments. Consequently, it does not
3 appear that SA-10 has had an impact on surface water and sediments of Trout Brook
4 or the Nashua River.
5
6

5.0 Preliminary Risk Evaluation

5.1 Risk Evaluation of Soils at Study Area SA-10

Inorganics. Several inorganic analytes (copper, iron, manganese, and nickel) were detected above background, however, none of these exceeded any human health or ecological criteria or guidelines. No human health guideline was exceeded in any sample.

Ecological soil protective contaminant levels (PCLs) were exceeded for several inorganic analytes (aluminum, lead, and vanadium). However, for every analyte, these PCLs are lower than background and thus would not add significantly to the baseline risk for ecological receptors at Fort Devens.

Organic Compounds. VOCs and TPHCs were not detected. Pesticides and PCBs were not detected at concentrations in soils above any applicable human health or ecological criteria.

5.2 Risk Evaluation of Surface Water and Sediment at Study Area SA-10

Inorganics. The following inorganic compounds detected in Nashua River sediments in SA-10 exceed the NYSDEC sediment criteria, the NOAA sediment criteria, or the PCL for ecological receptors exposed to surface soil: aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, mercury, nickel, silver, vanadium, and zinc (Table 4-3). These ecological criteria are exceeded for several metals in Trout Brook as well, although the concentrations in this tributary are generally lower than those of the river sediments in SA-10. Thus, there are potential risks to ecological receptors that may come into contact with sediment in this area of the Nashua River and its tributaries, or which may be seasonally exposed to dried sediment along the banks or shallow channel areas of the river.

In surface water of the Nashua River and Trout Brook (Table 4-2), only lead exceeds the AWQC. Lead is thus a potential source of ecological risk for aquatic receptors, and any terrestrial predators feeding on them.

Organic Compounds. The SVOC, bis(2-ethylhexyl)phthalate, was detected in sediments at concentrations exceeding the NYSDEC sediment criterion. Seven polynuclear aromatic hydrocarbons (PAHs) also exceeded the NOAA sediment criteria in SA-10. Eight pesticides exceeded either one or both of the sediment criteria (Table 4-3). Thus, the detected concentrations of PAHs and pesticides in sediments in this area of the Nashua River and its tributaries such as Trout Brook could potentially cause adverse effects on ecological receptors. Detected organic compounds do not have published surface water quality criteria, and therefore cannot be evaluated in this screening level risk assessment (Table 4-2). However, these contaminants do not appear to be attributable to SA-10.


6.0 Conclusions

No further action is recommended at SA-10. This recommendation is based on the historical information regarding the use of the site, visual observations, and the results of sampling and analysis. This recommendation is also based in part on the results of a preliminary risk evaluation.

No evidence of buried refuse or debris was observed during the investigation. The detection of low concentrations of metals and trace concentrations of pesticides in soils of SA-10 do not appear to indicate a source of contamination. Based on the results of the preliminary risk evaluation, the detected concentrations of these soil analytes are not likely to pose an unacceptable risk to human health or the environment. Although several metals, pesticides, and PAHs in surface water and sediments of the Nashua River may pose an ecological risk, these river sediment contaminants do not appear to be attributable to SA-10.

7.0 Decision

On the basis of findings at SA-10, there is no evidence or reason to conclude that the historical use of SA-10 as a construction debris area has caused significant environmental contamination or poses a threat to human health or the environment. The decision has been made to remove SA-10 from further consideration in the Installation Restoration Program (IRP) process. In accordance with CERCLA 120(h)(3), all remedial actions necessary have taken place, and the USEPA and MADEP signatures constitute concurrence in accordance with the same.

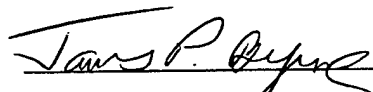


JAMES C. CHAMBERS
BRAC Environmental Coordinator

18 JAN 95

Date

U.S. ENVIRONMENTAL PROTECTION AGENCY



JAMES P. BYRNE
Fort Devens Remedial Project Manager

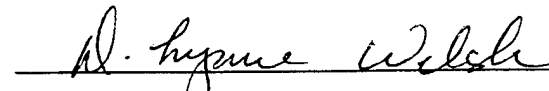
1/18/95

Date

☒ Concur

☐ Non-concur (please provide reasons for non-concurrence in writing)

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION



D. LYNNE WELSH
Section Chief, Federal Facilities - CERO

1/18/95

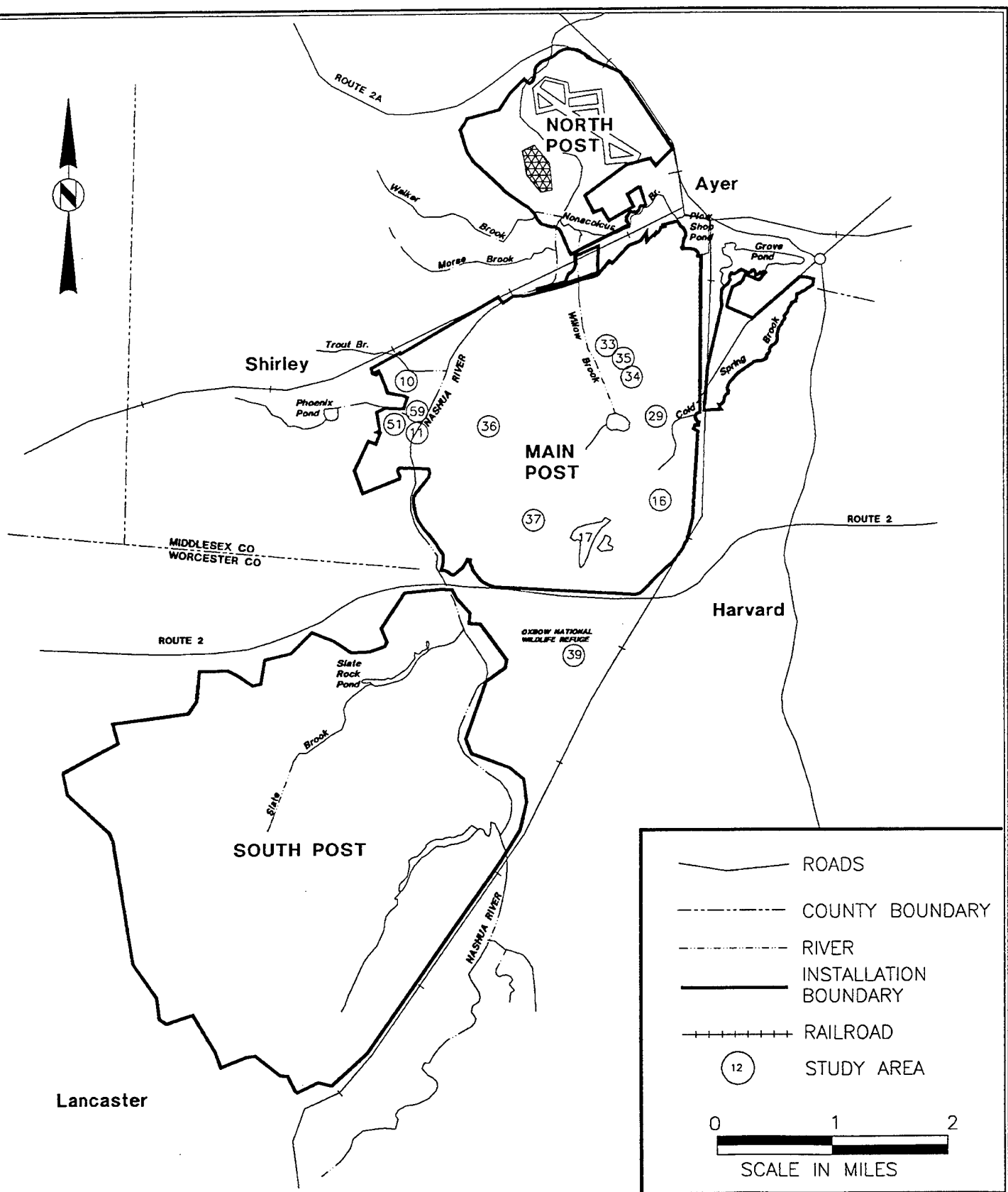
Date

☒ Concur

☐ Non-concur (please provide reasons for non-concurrence in writing)

8.0 References

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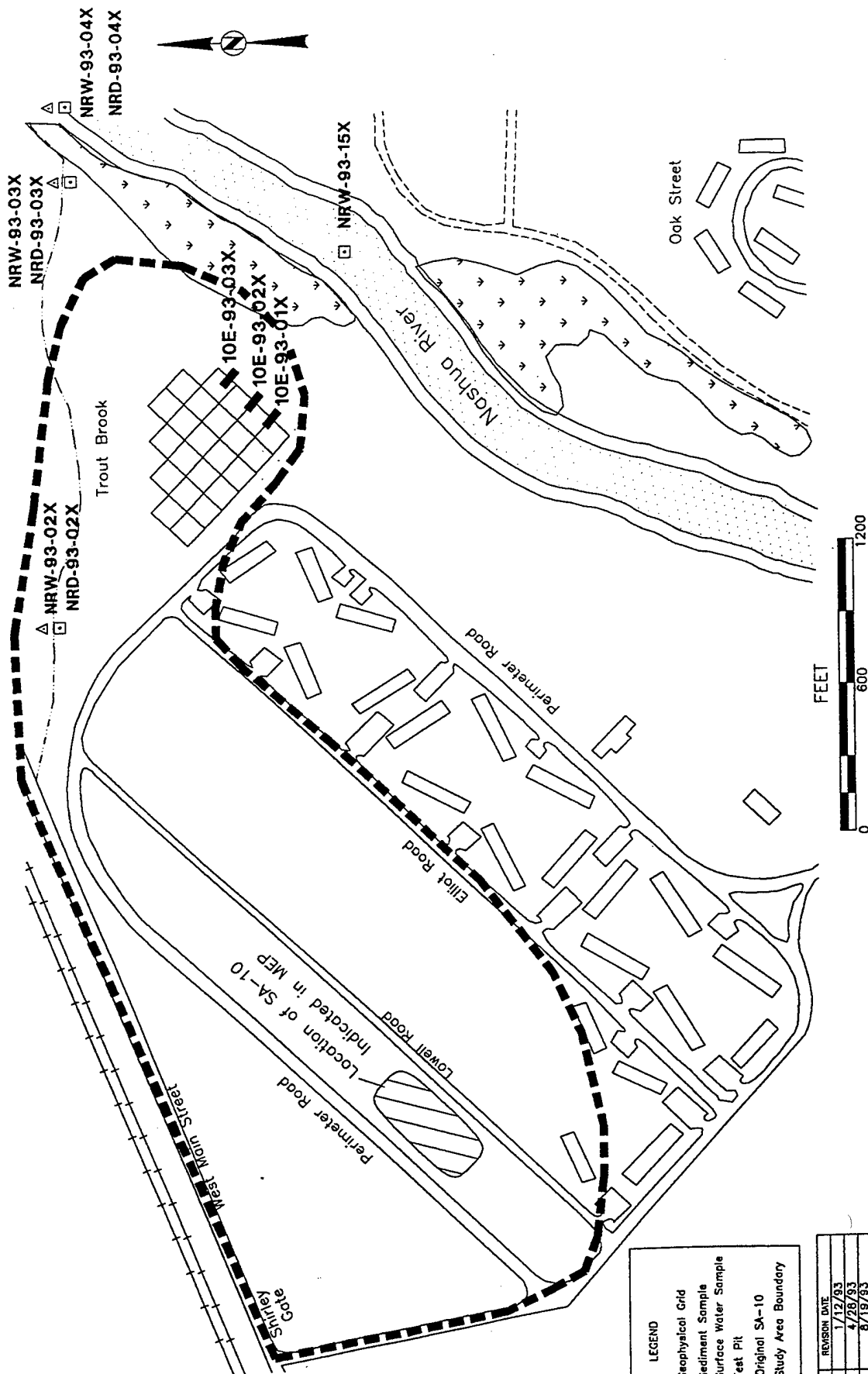
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USAEC	
DATE:	DWG. NO.:
NOV. 1993	67064-008
SCALE:	
AS SHOWN	



TITLE:

Figure 2-1

LOCATION OF STUDY AREAS
WITHIN FORT DEVENS



REVISION	
REV.	DATE
0	1/12/93
1	4/28/93
2	8/19/93
3	11/9/93

Figure 2-2 STUDY AREA 10 SITE MAP

DATE:

Arthur D Little

DRAWN BY: (INITIALS) TG

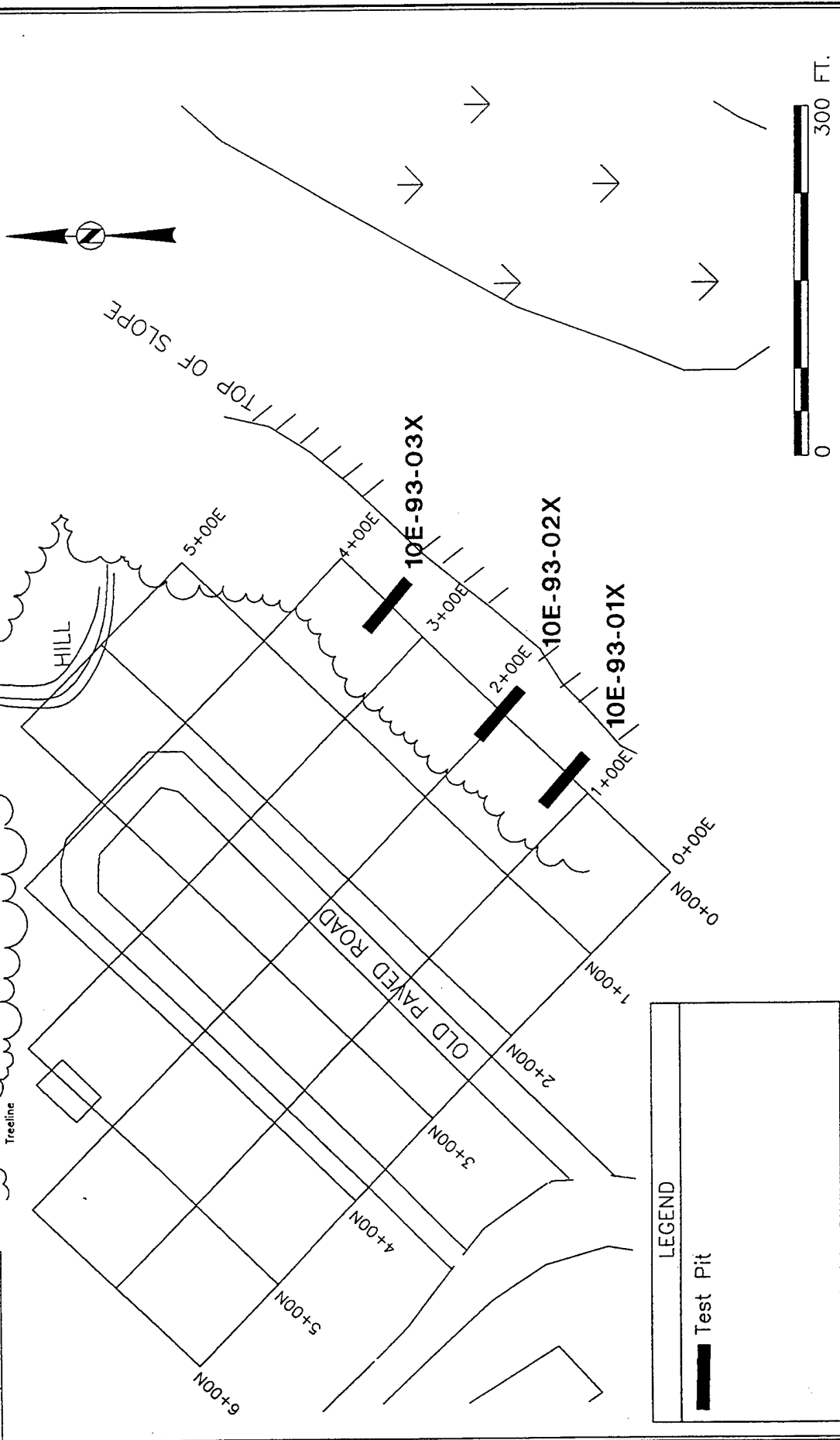
APPROVED BY: (INITIALS) MH

PREPARED FOR: USAEC

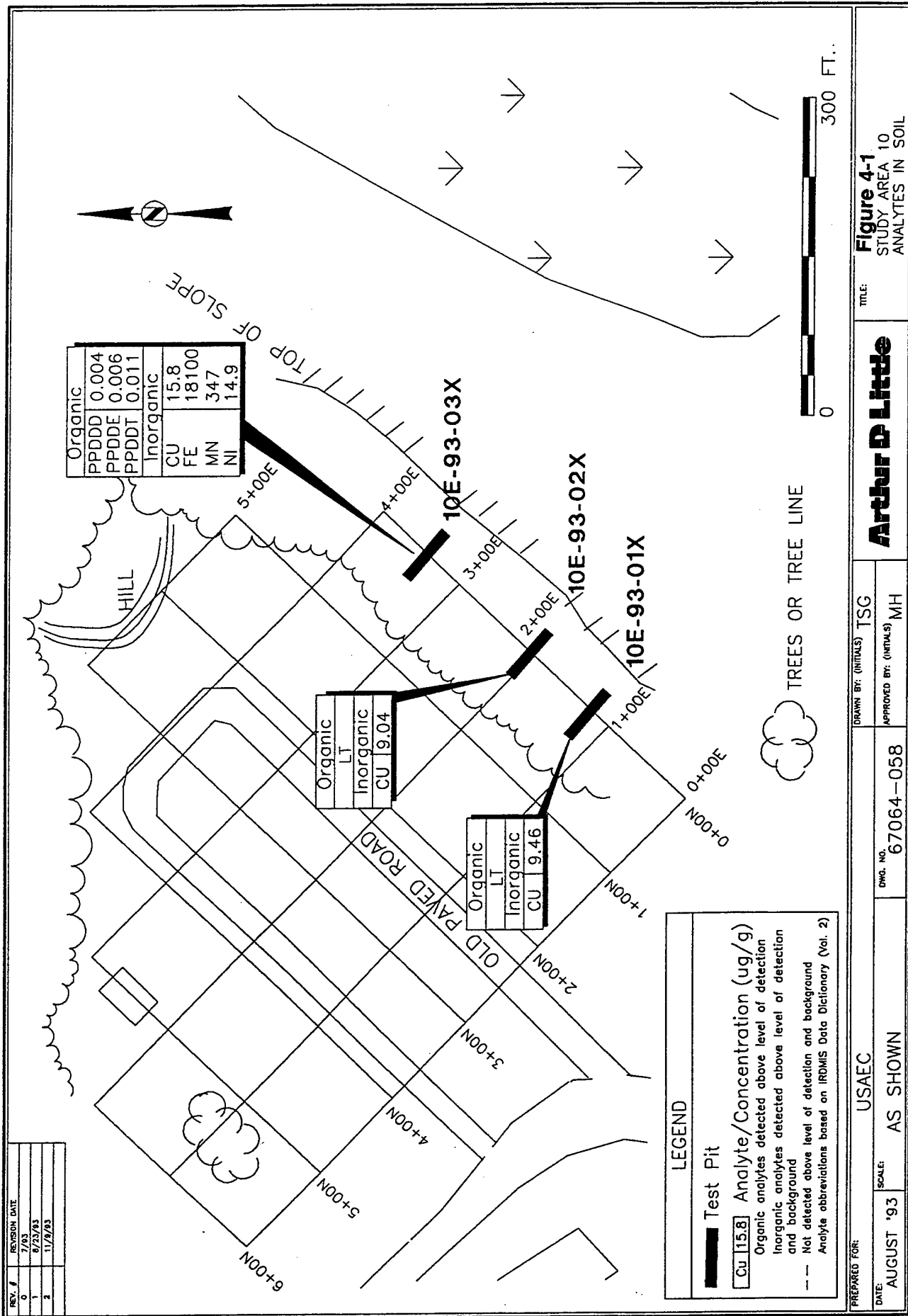
DWG. NO. 67064-010

SCALE: As Shown

REV. #	REVISION DATE
0	7/93
1	6/23/93
2	11/9/93



Arthur D Little		Figure 2-3 STUDY AREA 10 GEOPHYSICAL SURVEY & TEST PIT LOCATION	
PREPARED FOR: USAEC	DRAWN BY: (INITIALS) TSG	APPROVED BY: (INITIALS) MH	
DATE: AUGUST '93	SCALE: AS SHOWN	DWG. NO. 67064-050	



REV. #	REVISION DATE
0	8/27/93
1	11/10/93



NRD-93-11X
NRW-93-11X

NRD-93-12X

NRD-93-13X

NRD-93-03X
NRW-93-03X

NRD-93-02X
NRW-93-02X

NRD-93-04X
NRW-93-04X

NRW-93-15X

NRD-93-01X
NRW-93-01X

NRW-93-08X
NRD-93-08X

NRD-93-09X

NRD-93-10X

- △ Sediment Sample
- Water Sample
- Stream Gauge
- Study Area Boundary



PREPARED FOR: USAEC		DRAWN BY: (INITIALS) CAH		TITLE: Figure 4-2- STUDY AREA 10/NASHUA RIVER SAMPLING LOCATIONS	
DATE: 8/19/93	SCALE: As Shown	DWG. NO. 67064-056	APPROVED BY: (INITIALS) MH	Arthur D Little	

REV.	REVISION DATE
0	8/27/93
1	11/9/93

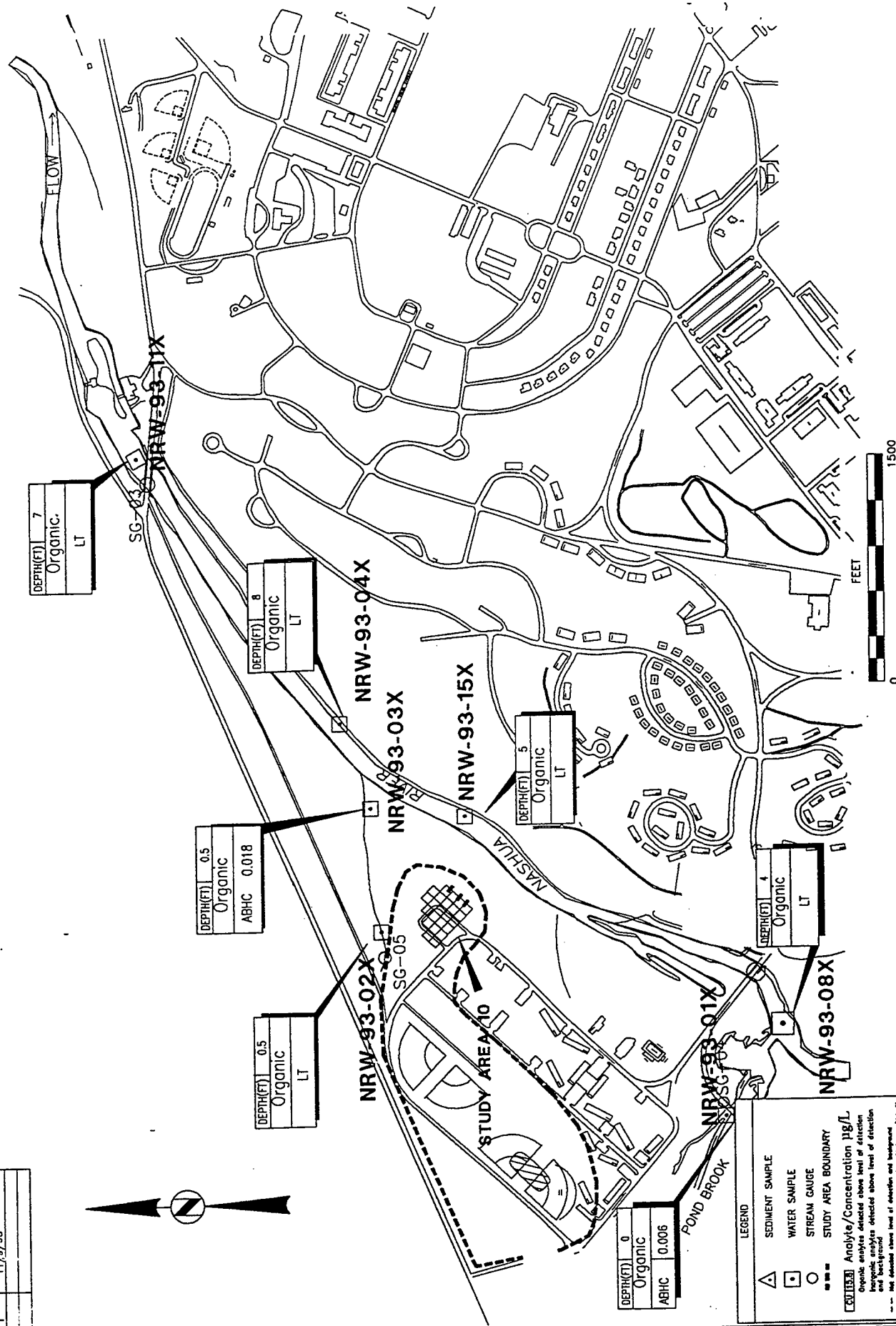


Figure 4-3 STUDY AREA 10 / NASHUA RIVER ORGANIC ANALYTES IN SURFACE WATER	
Arthur D Little	TITLE:
DRAWN BY: (INITIALS) CAH	APPROVED BY: (INITIALS) MH
DWG. NO. 67064-091	SCALE: As Shown
PREPARED FOR: USAEC	DATE: 8/19/93

REV.	REVISION DATE
0	8/27/93
1	11/9/93



DEPTH(FT)	0.5
Inorganic	
BA	7.41
CA	7220
PB	6.96
MN	2290
MG	44.2
NA	29000
NIT	140
PHOS	40.8
TKN	402
CL	32000
SO4	7300
ALK	23000
HARD	27000

DEPTH(FT)	0.5
Inorganic	
AL	158
BA	8.47
CA	8410
CU	569
MN	2340
MG	74.8
NA	28800
NIT	77
PHOS	22.3
TKN	301
TSS	5000
CL	40000
SO4	8500
ALK	14000
HARD	30000

DEPTH(FT)	7
Inorganic	
BA	25
CA	16400
CU	536
MN	2280
MG	141
NA	36300
K	3020
NIT	1100
PHOS	66.3
TKN	741
TSS	4000
CL	42000
SO4	16000
ALK	22000
HARD	49000

DEPTH(FT)	8
Inorganic	
BA	25.2
CA	15800
PB	6.14
FE	458
MN	2200
MG	137
NA	34800
K	2630
NIT	1000
PHOS	58.1
TKN	820
CL	43000
SO4	17000
ALK	22000
HARD	48000

DEPTH(FT)	5
Inorganic	
AS	2.55
BA	23.5
CA	15100
FE	459
MN	2040
MG	133
NA	32900
K	2490
NIT	1100
PHOS	60.5
TKN	738
CL	43000
SO4	17000
ALK	22000
HARD	45000

DEPTH(FT)	4
Inorganic	
BA	23.9
CA	15600
FE	453
MN	2080
MG	140
NA	33900
K	3150
NIT	1200
TKN	842
PHOS	70.6
CL	43000
SO4	18000
ALK	21000
HARD	47000

DEPTH(FT)	9
Inorganic	
BE	15.2
CA	14600
FE	479
MN	2920
MG	174
NA	27000
K	3670
NIT	1100
TKN	261
TSS	8000
CL	33000
SO4	13000
ALK	25000
HARD	48

LEGEND

SEDIMENT SAMPLE

WATER SAMPLE

STREAM GAUGE

STUDY AREA BOUNDARY

ANALYTE/CONCENTRATION µg/L

Organic analytes detected above level of detection and background

Inorganic analytes detected above level of detection and background

Not detected above level of detection and background

Analyte abbreviations based on 1992 EPA Data Dictionary (Vol. 2)



Figure 4-4

STUDY AREA 10/NASHUA RIVER

INORGANIC ANALYTES IN SURFACE WATER

Arthur D Little

DATE: 8/19/93

SCALE: As Shown

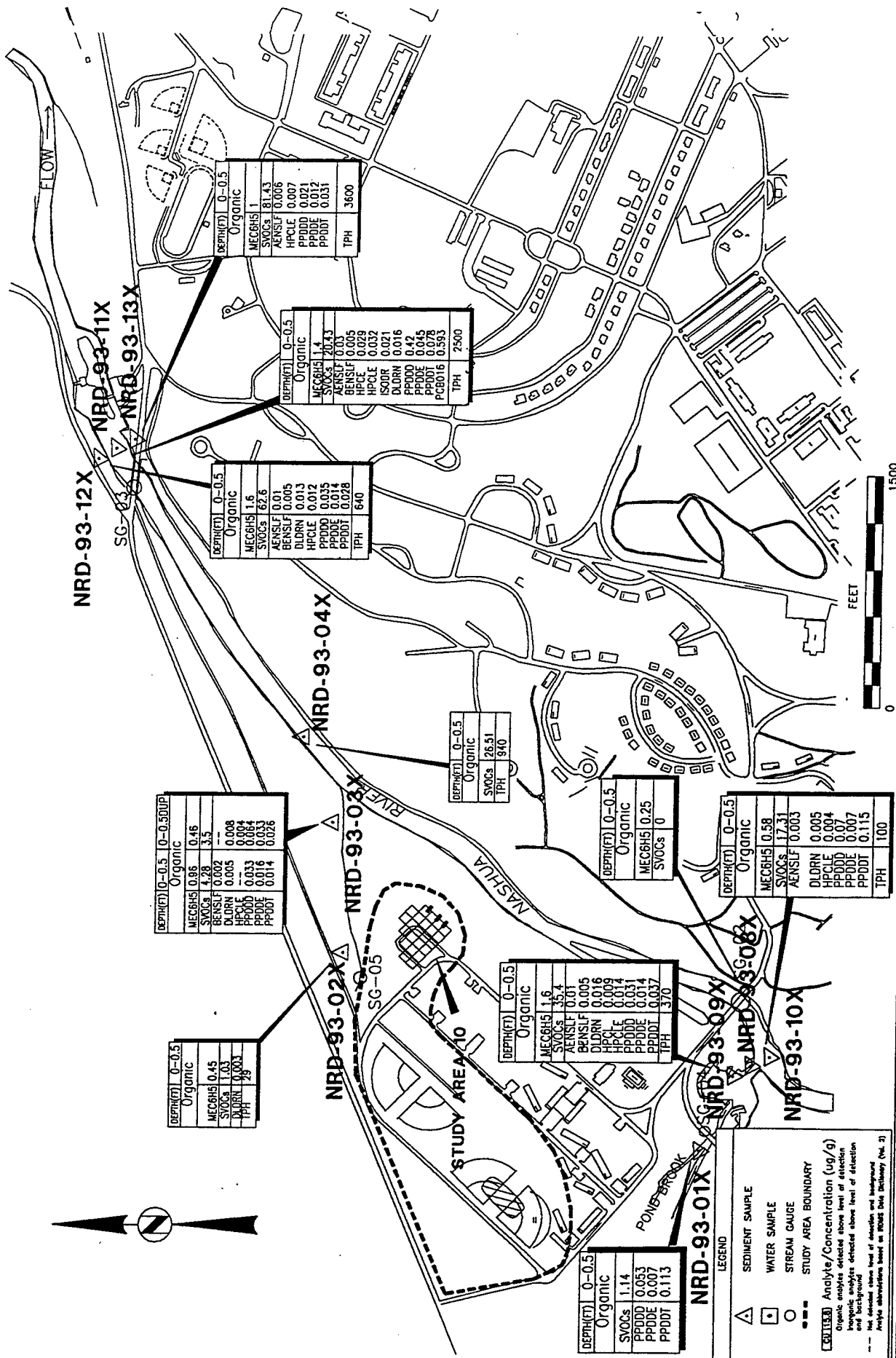
PREPARED FOR: USAEC

DWG. NO. 67064-090

APPROVED BY: (INITIALS) MH

DRAWN BY: (INITIALS) CAH

REV. #	REVISION DATE
0	8/27/93
1	10/2/93
2	11/9/93



PREPARED FOR: **USAEC**

DATE: 8/19/93 SCALE: As Shown

DWG. NO. 67064-089

APPROVED BY: (INITIALS) CAH

APPROVED BY: (INITIALS) MH

TITLE: **Figure 4-5**
 STUDY AREA 10/NASHUA RIVER
 ORGANIC ANALYTES IN SEDIMENT

REV. #	REVISION DATE
0	8/27/93
1	10/2/93
2	11/10/93



DEPTH (FT)	0-0.5	0-0.50UP
Inorganic		
AL	5520	11900
AS	5.3	12.5
BA	12.4	13.9
CA	665	27.5
CD	9.74	1280
CO	3.75	1880
CU	6.75	23.3
FE	9530	7.07
PB	12.3	17.1
MN	1840	16000
HG	0.281	88
NI	9.08	2880
K	5.23	1.11
V	8.89	0.714
ZN	31.5	15.1

DEPTH (FT)	0-0.5
Inorganic	
AL	6640
AS	7.34
BA	24.8
CA	1510
CD	65.2
CO	9.02
CU	12.9
FE	12700
PB	12.9
MN	3160
HG	163
NI	0.444
K	11.5
SE	462
AG	1.04
NA	3.24
V	72.1
ZN	11.7

DEPTH (FT)	0-0.5
Inorganic	
AL	21200
AS	17.9
BA	252
CA	3.45
CD	3160
CO	1.68
CU	1.78
FE	26900
PB	240
MN	3580
HG	624
NI	9.1
K	1890
SE	1.67
AG	26.4
NA	13.4
V	184
ZN	74.6

DEPTH (FT)	0-0.5
Inorganic	
AL	4020
AS	9.36
BA	16.7
CA	367
CD	10.6
CO	6.02
CU	6820
FE	12
PB	1160
MN	60.4
HG	0.159
NI	4.33
K	5.57
V	30.5
ZN	30.5

DEPTH (FT)	0-0.5
Inorganic	
AL	7210
AS	9.6
BA	57.4
CA	7.22
CD	1690
CO	38.7
CU	56.5
FE	9110
PB	61
MN	1580
HG	1.13
NI	6.36
K	410
AG	2.56
NA	11.9
V	11.9
ZN	119

DEPTH (FT)	0-0.5
Inorganic	
AL	23500
AS	19.6
BA	11.8
CA	2610
CD	244
CO	10.4
CU	360
FE	14500
PB	740
MN	2910
HG	7.11
NI	26.2
K	15.70
SE	6.9
AG	303
NA	45.2
V	31.7
ZN	642

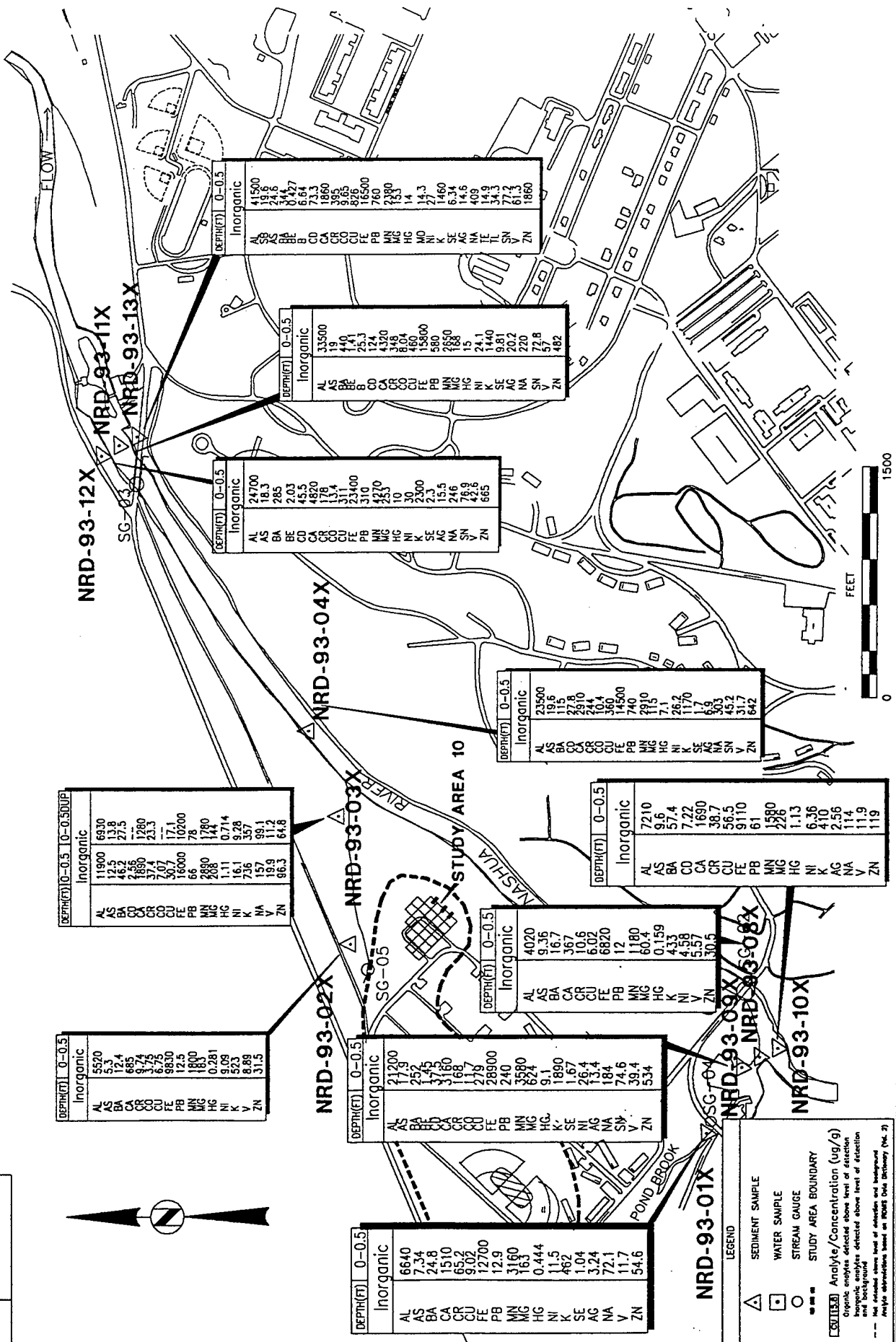
DEPTH (FT)	0-0.5
Inorganic	
AL	24700
AS	18.3
BA	285
BE	2.03
CD	45.5
CA	4820
CO	1.78
CU	13.4
FE	311
PB	32400
MN	310
HG	4270
NI	30
K	2300
SE	15.5
AG	246
NA	76.9
V	42.6
ZN	665

DEPTH (FT)	0-0.5
Inorganic	
AL	33500
AS	19
BA	140
BE	25.3
CD	4320
CA	348
CO	8.04
CU	480
FE	13800
PB	580
MN	2880
HG	15
NI	24.1
K	9.81
SE	20.2
AG	220
NA	72.8
V	57
ZN	482

DEPTH (FT)	0-0.5
Inorganic	
AL	41500
AS	19.6
BA	24.6
BE	0.457
CD	6.64
CA	73.3
CO	1860
CU	395
FE	9.65
PB	82600
MN	780
HG	14
NI	13.3
K	1460
SE	6.34
AG	14.6
NA	409
V	14.9
ZN	34.3

- LEGEND
- SEDIMENT SAMPLE
 - WATER SAMPLE
 - STREAM GAUGE
 - STUDY AREA BOUNDARY

ANALYTES/CONCENTRATION (UG/G)
 Inorganic analytes detected above level of detection
 Organic analytes detected above level of detection
 -- Not detected above level of detection and background
 Analyte abbreviations listed on inside back cover (pg. 2)



PREPARED FOR: **USAEC**

DATE: **8/19/93** SCALE: **As Shown**

DWG. NO. **67064-088**

APPROVED BY: (INITIALS) **CAH**

ORIGIN BY: (INITIALS) **CAH**

TITLE: **Figure 4-6**
STUDY AREA 10/NASHUA RIVER
INORGANIC ANALYTES IN SEDIMENT

Table 4-1
Fort Devens Main Post Site Investigation
Study Area 10 - Analytes in Soil

Site ID Field Sample ID Sample Depth (ft)	Ft. Devens Soil Background	Residential Criteria	Ecological Surface Soil Criteria	10E-93-01X AJXTP01X 0 - 16	10E-93-02X AJXTP02X 0 - 16	10E-93-03X AJXTP03X 0 - 16
Volatile Organic Compounds (ug/g) <i>not detected or less than detection limit</i>						
Total Petroleum Hydrocarbons (ug/g) <i>not detected or less than detection limit</i>						
Semi-Volatile Organic Compounds (ug/g) <i>not detected or less than detection limit</i>						
Pesticides and PCBs (ug/g)						
p,p'-DDD		2	1.07	0.003 LT	0.003 LT	0.004
p,p'-DDE		2	1.07	0.003 LT	0.003 LT	0.006
p,p'-DDT		2	1.07	0.004 LT	0.004 LT	0.011
Metals (ug/g)						
Aluminum	15000	230000	1700	4450	6530	7240
Arsenic	21	23	33	12.6	12.1	19.4
Barium	42.5	5500	41	9.95	11.8	18.4
Calcium	1400	--	--	462	381	357
Chromium	31	390	180	9.47	10.7	10.9
Cobalt	--	10	50	3.56	4.2	6.12
Copper	8.39	2900	34	9.46	9.04	15.8
Iron	15000	--	--	9770	9790	18100
Lead	48.4	300	4	4.7	6.2	9.7
Magnesium	5600	--	--	2290	2010	2240
Manganese	300	390	1500	143	95.6	347
Nickel	14	300	100	11.4	11.6	14.9
Potassium	1700	--	--	273	401	438
Vanadium	28.7	550	10	6.79	8.24	10.6
Zinc	35.5	2500	640	17.9	24.3	28.7

Notes:

ND=not detected

LT=less than detection limit

B=above Fort Devens soil background

H=above human health guideline

E=above ecological guideline

11/10/93

Table 4-2
Fort Devens Main Post Site Investigation
Study Area 10 - Analytes in Surface Water

Site ID Field Sample ID Sample Depth (ft)	Ambient Water Quality Criteria	NRW-93-01X ALXSW01X 0	NRW-93-02X ALXSW02X 0.5	NRW-93-03X ALXSW03X 0.5	NRW-93-03X ALDWS03X 0.5	NRW-93-04X ALXSW04X 8	NRW-93-08X ALXSW08C 4	NRW-93-11X ALXSW07C 7	NRW-93-15X ALXSW09X 5
Volatile Organic Compounds (ug/L) <i>not detected or less than detection limit</i>									
Semivolatile Organic Compounds (ug/L) <i>not detected or less than detection limit</i>									
Total Petroleum Hydrocarbons (ug/L) <i>not detected or less than detection limit</i>									
Organochlorine Pesticides and PCBs (ug/L) alpha-benzenehexachloride isodrin	..	0.006 0.003 LT	0.003 LT 0.003 LT	0.018 0.003 LT	0.015 0.003 LT	0.003 LT 0.003 LT	0.003 LT 0.003 LT	0.003 LT 0.003 LT	0.003 LT 0.006
Explosives (ug/L) 1,3,5-Trinitrobenzene	..	0.21 LT	0.21 LT	0.21 LT	0.253	0.21 LT	0.21 LT	0.21 LT	0.21 LT
Metals (ug/L) Aluminum Arsenic Barium Beryllium Calcium Iron Lead* Magnesium Manganese Potassium Sodium	.. 48 .. 5.3 .. 1000 0.69	112 LT 2.35 LT 15.2 1.11 14600 479 4.47 LT 2820 174 3870 27000	112 LT 2.35 LT 7.41 1.12 LT 7220 77.5 LT 6.96 2290 44.2 1240 LT 29000	158 2.35 LT 8.47 1.12 LT 8410 569 4.47 LT 2340 74.8 1240 LT 28800	112 LT 2.35 LT 8.68 1.12 LT 8820 515 4.47 LT 2430 86.2 1240 LT 29700	112 LT 2.35 LT 25.2 1.12 LT 15800 459 6.14 2200 137 2630 34800	112 LT 2.35 LT 23.9 1.12 LT 15600 453 4.47 LT 2080 140 3150 33900	112 LT 2.35 LT 25 1.12 LT 16400 536 4.47 LT 2280 141 3020 36300	112 LT 2.55 23.5 1.12 LT 15100 459 4.47 LT 2040 133 2490 32900
Water Quality Parameters (ug/L) Nitrate/Nitrite Phosphorous Total Nitrogen Total Suspended Solids Chloride Sulfate Alkalinity Total Hardness	.. 0.1 .. 230000 .. 20000 ..	1100 10 LT 261 8000 33000 13000 25000 48	140 40.8 402 4000 LT 32000 7300 23000 27000	77 22.3 301 5000 40000 8500 14000 30000	100 17.5 336 4000 LT 40000 8800 15000 31000	1000 58.1 820 4000 LT 43000 17000 22000 48000	1200 70.6 842 4000 LT 43000 18000 21000 47000	1100 68.3 741 4000 42000 16000 22000 49000	1100 60.5 738 4000 LT 43000 17000 22000 45000

Notes:
 ND = Not detected
 LT = Less than detection limit
 E=Above surface water criteria
 *Average area hardness of 30 mg/L used to adjust lead AWQC.

12/2/93

Table 4-3
Fort Devens Main Post Site Investigation
Study Area 10 - Analytes in Sediments

Site ID Field Sample ID Sample Depth (ft)	TOC-Adjusted NYSDEC Sediment Crt.*	NOAA Sediment Criteria	Ecological Surface Soil Criteria	FL Devens Soil Background	NRD-93-01X ALXSD01X 0 - 0.5	NRD-93-02X ALXSD02X 0 - 0.5	NRD-93-03X ALDSD03X 0 - 0.5	NRD-93-03X ALXSD03X 0 - 0.5	
Volatile Organic Compounds (ug/g) <i>Aromatics</i> Toluene	--	--	1800		0.1 LT	0.45	0.46	0.96	
Semivolatile Organic Compounds (ug/g) <i>Phthalates</i> Di-N-butyl phthalate Bis(2-ethylhexyl)phthalate	0.030 --	-- --	2850 84		1.3 LT NY, 0.48 LT	1.3 LT NY, 0.48 LT	1.3 LT NY, 0.48 LT	1.3 LT NY, 0.48 LT	
<i>Polynuclear Aromatics</i> Acenaphthylene Acenaphthene Fluorene Phenanthrene Fluoranthene Pyrene Benzo (a) Anthracene Chrysene Benzo (b) Fluoranthene Benzo (k) Fluoranthene Benzo (ghi) Perylene	-- -- -- -- -- 8,340 -- -- -- -- --	-- 0.15 0.035 0.225 0.6 0.35 0.23 0.4 -- -- --	2800 -- 1100 510 1100 550 8.9 440 180 320 180		0.033 LT 0.041 LT 0.065 LT 0.33 0.15 0.31 0.16 0.19 0.31 LT 0.13 LT 0.18 LT	0.033 LT 0.041 LT 0.065 LT 0.18 0.15 0.33 0.16 0.21 0.31 LT 0.13 LT 0.18 LT	0.15 0.041 LT 0.065 LT 0.5 0.44 0.88 0.37 0.57 0.31 LT 0.59 0.18 LT	0.22 0.041 LT 0.065 LT 0.64 0.46 1.1 0.47 0.69 0.31 LT 0.7 0.18 LT	-- -- NOAA NOAA -- NOAA NOAA NOAA NOAA -- --
Pesticides/Herbicides/PCBs (ug/g) <i>Organochlorine Pesticides</i> Endosulfan I Endosulfan II Dieldrin Heptachlor Heptachlor Epoxide Isodrin p,p'-DDD p,p'-DDE p,p'-DDT Toxaphene <i>PCBs</i> PCB 1018	0.002 0.002 1,170 0.002 0.002 -- -- 3,000 3,000 0.001 16,560 3,000	-- -- 0.00002 -- -- -- 0.002 0.002 0.001 -- --	-- -- 0.64 -- -- -- 1.07 1.07 -- 3.1 --		0.001 LT 0.001 LT 0.002 LT 0.002 LT NY, 0.001 LT 0.003 LT 0.053 0.007 0.113 0.226 LT NY, 0.1 LT	0.001 LT 0.001 LT 0.003 0.002 LT NY, 0.001 LT 0.003 LT 0.003 LT 0.003 LT 0.004 LT 0.226 LT NY, 0.1 LT	0.001 LT 0.001 LT 0.008 0.002 LT NY, 0.004 LT NY, 0.003 LT 0.064 LT 0.033 0.026 0.226 NY, 0.1 LT	0.001 LT 0.002 NY, 0.005 LT 0.002 LT NY, 0.001 LT 0.003 LT 0.033 0.016 0.014 0.226 LT NY, 0.1 LT	-- -- NOAA -- -- -- NOAA NOAA NOAA NOAA --

Notes:

LT = Less than detection limit

ND=Not detected

B = Above Ft. Devens soil background

NY=Above NY sed. crit.

NOAA = above NOAA sed. crit.

E = above surface soil eco. crit.

* TOC = 6%

11/11/93

Table 4-3

Fort Devens Main Post Site Investigation
Study Area 10 - Analytes in Sediments

Site ID Field Sample ID Sample Depth (ft)	TOC-Adjusted NYSDEC Sediment Crit.*	NOAA Sediment Criteria	Ecological Surface Soil Criteria	FL Devens Soil Background	NRD-93-01X ALXSD01X 0-0.5	NRD-93-02X ALXSD02X 0-0.5	NRD-93-03X ALDSD03X 0-0.5	NRD-93-03X ALXSD03X 0-0.5								
Explosives (ug/g) <i>not detected or less than detection limit</i>	--	4	--		40	--	NOAA	29	--	NOAA	10 LT	NOAA	31	--	NOAA	
Total Petroleum Hydrocarbons (ug/g)					6640	--	NOAA	5520	--	NOAA	6930	--	NOAA	11900	--	NOAA
Metals (ug/g)	Metals not adjusted for TOC															
Aluminum	--	--	1700	15000												
Arsenic	5	33	33	21	7.34	NY,	E	5.3	NY,	E	13.8	NY,	E	12.5	NY,	E
Barium	--	--	41	42.5	24.8	--	--	12.4	--	--	27.5	--	--	46.2	--	E
Beryllium	--	--	0.88	0.347	0.427 LT	--	B	0.427 LT	--	B	0.427 LT	--	B	0.427 LT	--	B
Boron	--	--	--	--	6.64 LT	--	--	6.64 LT	--	--	6.64 LT	--	--	6.64 LT	--	B
Cadmium	0.8	5	0.44	2	1.2 LT	NY,	E	1.2 LT	NY,	E	1.2 LT	NY,	E	2.56	NY,	E
Calcium	--	--	--	1400	1510	--	B	685	--	--	1280	--	--	1890	--	B
Chromium	26	80	180	31	65.2	NY,	B	9.74	--	--	23.3	--	--	37.4	NY,	B
Cobalt	--	--	50	--	2.5 LT	--	--	3.75	--	--	2.5 LT	--	--	7.07	--	B
Copper	19	70	34	8.39	9.02	--	B	6.75	--	--	17.1	--	B	30.7	NY,	B
Iron	--	--	--	15000	12700	--	--	9830	--	--	10200	--	--	18000	--	B
Lead	27	35	4	48.4	12.9	--	E	12.5	--	E	78	NY,	NOAA	66	NY,	NOAA
Magnesium	428	--	--	5600	3160	--	--	1800	--	--	1780	--	--	2890	--	E
Manganese	--	--	1500	300	163	--	--	183	--	--	144	--	--	208	--	B
Mercury	0.11	0.15	3.6	0.22	0.444	NY,	NOAA	0.281	NY,	NOAA	0.714	NY,	NOAA	1.11	NY,	NOAA
Nickel	22	30	100	14	11.5	--	--	9.09	--	--	9.28	--	--	16.1	--	B
Potassium	--	--	--	1700	462	--	--	523	--	--	357	--	--	736	--	B
Selenium	--	--	0.48	--	1.04	--	E	0.449 LT	--	--	0.449 LT	--	--	0.449 LT	--	B
Silver	--	1	72	0.086	3.24	--	NOAA	0.803 LT	--	--	0.803 LT	--	B	0.803 LT	--	B
Sodium	--	--	--	131	72.1	--	--	38.7 LT	--	--	99.1	--	--	157	--	B
Tin	--	--	--	--	7.43 LT	--	--	7.43 LT	--	--	7.43 LT	--	--	7.43 LT	--	B
Vanadium	--	--	10	28.7	11.7	--	E	8.89	--	--	11.2	--	E	19.9	--	E
Zinc	85	120	640	35.5	54.6	--	B	31.5	--	--	64.8	--	B	96.3	NY,	B

Notes:

LT = Less than detection limit
 ND = Not detected
 B = Above FL Devens soil background
 NY = Above NY sed. crit.
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 E = above surface soil eco. crit.
 * TOC = 6%

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Table 4-3
Fort Devens Main Post Site Investigation
Study Area 10 - Analytes in Sediments

Site ID Field Sample ID Sample Depth (ft)	TOC-Adjusted NYSDEC Sediment Cnt.*	NOAA Sediment Criteria	Ecological Surface Soil Criteria	Fl. Devens Soil Background	NRD-93-04X ALXSD04X 0-0.5	NRD-93-08X ALXSD08X 0-0.5	NRD-93-09X ALXSD09X 0-0.5	NRD-93-10X ALXSD10X 0-0.5
Volatile Organic Compounds (ug/g)								
<i>Aromatics</i>								
Toluene	-	-	1800		0.1 LT	0.25	1.6	0.58
Semi-volatile Organic Compounds (ug/g)								
<i>Phthalates</i>								
Di-N-butyl phthalate	0.030	-	2650		11 NY, 0.48 LT	1.3 LT NY, 0.48 LT	1.3 LT NY, 18	4.1 NY, 6.4
Bis(2-ethylhexyl)phthalate	-	-	84					
<i>Polynuclear Aromatics</i>								
Acenaphthylene	-	-	2600		0.81	0.033 LT	1.4	0.65
Acenaphthene	-	0.15	-		0.041 LT	0.041 LT	0.041 LT	0.041 LT
Fluorene	-	0.035	1100		0.065 LT	0.065 LT	0.065 LT	0.065 LT
Phenanthrene	-	0.225	510		1.4	1.9	1.9	0.89
Fluoranthene	-	0.6	1100		1.6	2.1	2.1	0.88
Pyrene	8,340	0.35	550		3.5	3.8	3.8	1.8
Benzo (a) Anthracene	-	0.23	8.9		1.1	1.6	1.6	0.62
Chrysene	-	0.4	440		2.1	2.7	2.7	1.1
Benzo (b) Fluoranthene	-	-	180		2	0.31 LT	4.1	0.31 LT
Benzo (k) Fluoranthene	-	-	320		1.8	0.13 LT	0.13 LT	0.87
Benzo (ghi) Perylene	-	-	180		1.2	0.18 LT	0.18 LT	0.18 LT
Pesticides/Herbicides/PCBs (ug/g)								
<i>Organochlorine Pesticides</i>								
Endosulfan I	0.002	-	-		0.001 LT	0.001 LT	0.01 NY,	0.003 NY,
Endosulfan II	0.002	-	-		0.001 LT	0.001 LT	0.005 NY,	0.001 LT
Dieldrin	1.170	0.00002	-		0.002 LT	0.002 LT	0.016	0.005
Heptachlor	0.002	-	0.64		0.001 LT	0.002 LT NY,	0.009 NY,	0.002 LT NY,
Heptachlor Epoxide	0.002	-	-		0.003 LT NY,	0.001 LT	0.014 NY,	0.004 NY,
Isodrin	-	-	-		0.003 LT	0.003 LT	0.003 LT	0.003 LT
p,p'-DDD	-	0.002	1.07		0.003 LT	0.003 LT	0.031	0.07
p,p'-DDE	3.000	0.002	1.07		0.003 LT	0.003 LT	0.014	0.007
p,p'-DDT	3.000	0.001	1.07		0.004 LT	0.004 LT	0.037	0.115
Toxaphene	0.001	-	-		0.226 LT NY,	0.226 LT NY,	0.226 LT NY,	0.226 NY,
<i>PCBs</i>								
PCB 1016	16,560	-	3.1		0.1 LT	0.1 LT	0.1 LT	0.1 LT
	3.000	-	-					

Notes:
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 ND=Not detected
 B = Above Ft. Devens soil background
 NY=Above NY sed. crit.
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Fort Devens Main Post Site Investigation
Study Area 10 - Analytes in Sediments

Site ID Field Sample ID Sample Depth (ft)	TOC-Adjusted NYSDEC Sediment Crit.*	NOAA Sediment Criteria	Ecological Surface Soil Criteria	Ft. Devens Soil Background	NRD-93-04X ALXSD04X 0-0.5	NRD-93-08X ALXSD06C 0-0.5	NRD-93-08X ALXSD06E 0-0.5	NRD-93-10X ALXSD06W 0-0.5
Explosives (ug/g) <i>not detected or less than detection limit</i>	--	4	--		940	10 LT - NOAA	370	100 - NOAA
Total Petroleum Hydrocarbons (ug/g)								
Metals (ug/g)								
Aluminum	15000	1700			23500	- E B	21200	7210 - E
Arsenic	21	33			19.6 NY	- E B	17.9 NY	9.6 NY
Barium	42.5	41			115	- E B	252	57.4 - E B
Beryllium	0.347	0.88			0.427 LT	- B	1.45	0.427 LT - B
Boron	--	--			6.64 LT	-	6.64 LT	6.64 LT -
Cadmium	2	0.44			27.8 NY, NOAA	- E	37.5 NY, NOAA	7.22 NY, NOAA
Calcium	1400	--			2910	- B	3160	1690 - B
Chromium	31	180			244 NY, NOAA	- B	168 NY, NOAA	38.7 NY
Cobalt	--	50			10.4	-	11.7	2.5 LT
Copper	8.39	34			360 NY, NOAA	-	279 NY, NOAA	56.5 NY
Iron	15000	--			14500	-	28900	9110 -
Lead	48.4	4			740 NY, NOAA	- E	240 NY, NOAA	61 NY, NOAA
Magnesium	5600	--			2910	-	3580	1580 -
Manganese	300	1500			115	-	624	226 -
Mercury	0.22	3.6			7.1 NY, NOAA	- NY, NOAA	9.1 NY, NOAA	1.13 NY, NOAA
Nickel	14	100			26.2 NY	- B	26.4 NY	6.36 -
Potassium	1700	--			1170	-	1890	410 -
Selenium	--	0.48			1.7	- E	1.67	0.449 LT
Silver	0.086	72			6.9	- NOAA	13.4	2.58 - NOAA
Sodium	131	--			303	- B	184	114 -
Tin	--	--			45.2	-	74.6	7.43 LT
Vanadium	28.7	10			31.7	- E B	39.4	11.9 - E
Zinc	35.5	640			642 NY, NOAA	-	534 NY, NOAA	119 NY

Notes:
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Table 4-3
Fort Devens Main Post Site Investigation
Study Area 10 - Analytes in Sediments

Site ID Field Sample ID Sample Depth (ft)	TOC-Adjusted NYDEC Sediment Crit.*	NOAA Sediment Criteria	Ecological Surface Soil Criteria	Fl. Devens Soil Background	NRD-93-11X ALXSD07C 0-0.5	NRD-93-12X ALXSD07E 0-0.5	NRD-93-13X ALXSD07W 0-0.5
Volatile Organic Compounds (ug/g)							
Aromatics							
Toluene	--	--	1800		1.4	1.6	1
Semivolatile Organic Compounds (ug/g)							
Phthalates							
Di-N-butyl phthalate	0.030	--	2650		1.3 LT NY, 13	14 NY, 31	1.3 LT NY, 15
Bis(2-ethylhexyl)phthalate	--	--	84				
Polynuclear Aromatics							
Acenaphthylene	--	--	2600		0.83	1.6	4.8
Acenaphthene	--	0.15	--		0.041 LT	0.041 LT	0.33 - NOAA
Fluorene	--	0.035	1100		0.5	0.065 LT	1.7 - NOAA
Phenanthrene	--	0.225	510		1.7	2.5	7.9 - NOAA
Fluoranthene	--	0.6	1100		1	2.6	6.6 - NOAA
Pyrene	8.340	0.35	550		2	5.8	17 NY, NOAA
Benzo (a) Anthracene	--	0.23	8.9		0.041 LT	2	4.8 - NOAA
Chrysene	--	0.4	440		0.032 LT	3.3	8.1 - NOAA
Benzo (k) Fluoranthene	--	--	180		0.31 LT	0.31 LT	11
Benzo (ghi) Perylene	--	--	320		1.4	0.13 LT	0.13 LT
	--	--	180		0.18 LT	0.18 LT	4.2
Pesticides/Herbicides/PCBs (ug/g)							
Organochlorine Pesticides							
Endosulfan I	0.002	--	--		0.03 NY,	0.01 NY,	0.006 NY,
Endosulfan II	0.002	--	--		0.005 NY,	0.005 NY,	0.001 LT
Dieldrin	1.170	0.00002	--		0.016	0.008 LT - NOAA	0.008 LT - NOAA
Heptachlor	0.002	--	0.64		0.029 NY,	0.007 LT NY,	0.007 LT NY,
Heptachlor Epoxide	0.002	--	--		0.032 NY,	0.002 LT NY,	0.002 LT NY,
Isodrin	--	--	--		0.021	0.012	0.007
p,p'-DDD	--	0.002	1.07		0.42	0.036 LT - NOAA	0.036 LT - NOAA
p,p'-DDE	3.000	0.002	1.07		0.045	0.035	0.021
p,p'-DDT	3.000	0.001	1.07		0.078	0.014	0.012
Toxaphene	0.001	--	--		0.228 NY,	0.028 NY,	0.031 NY,
PCBs							
PCB 1016	16.560	--	3.1		0.593	0.1 LT	0.1 LT
	3.000	--	--				

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 * TOC = 6%

Table 4-3
Fort Devens Main Post Site Investigation
Study Area 10 - Analytes in Sediments

Site ID Field Sample ID Sample Depth (ft)	TOC-Adjusted NYSDEC Sediment Crt.*	NOAA Sediment Criteria	Ecological Surface Soil Criteria	Ft. Devens Soil Background	NRD-93-11X ALXSD07C 0 - 0.5	NRD-93-12X ALXSD07E 0 - 0.5	NRD-93-13X ALXSD07W 0 - 0.5
Explosives (ug/g) <i>not detected or less than detection limit</i>	--	4	--		2500	640	3600
Total Petroleum Hydrocarbons (ug/g)							
Metals (ug/g)	Metals not adjusted for TOC						
Aluminum	--	--	1700	15000	33500	24700	41500
Arsenic	5	33	33	21	19	18.3	24.6
Barium	--	--	41	42.5	440	285	344
Beryllium	--	--	0.88	0.347	1.41	2.03	0.427
Boron	--	--	--	--	25.3	6.64 LT	6.64 LT
Cadmium	0.8	5	0.44	2	124	45.5	73.3
Calcium	--	--	--	1400	4320	4820	1860
Chromium	26	80	180	31	348	178	395
Cobalt	--	--	50	--	8.04	13.4	9.65
Copper	19	70	34	--	460	311	826
Iron	--	--	--	15000	15800	23400	16500
Lead	27	35	4	48.4	580	310	760
Magnesium	--	--	--	5600	2650	4270	2380
Manganese	428	--	1500	300	188	253	153
Mercury	0.11	0.15	3.6	0.22	15	10	14
Nickel	22	30	100	14	24.1	30	27
Potassium	--	--	--	1700	1440	2300	1460
Selenium	--	--	0.48	--	9.81	2.3	6.34
Silver	--	1	72	0.086	20.2	15.5	14.6
Sodium	--	--	--	131	220	246	409
Tin	--	--	--	--	72.8	76.9	77.2
Vanadium	--	--	10	28.7	57	42.6	61.3
Zinc	85	120	640	35.5	482	865	1860

Notes:

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